

R E M A R K S

The features of claim 3 were included in claim 1.

The features of claim 17 were included in claims 13 and 16.

Applicants' present claims are directed to a hot-dip galvanized steel sheet.

Applicants' present claim 1 concerns a hot-dip galvanized steel sheet comprising:

a plating layer consisting essentially of a η phase; and
an oxide layer disposed on a surface of the plating layer,
the oxide layer having an average thickness of 10 nm or more; and
the oxide layer comprising a Zn-based oxide layer and an Al-based oxide layer, the Zn-based oxide layer having a Zn/Al atomic concentration ratio of more than 1 and the Al-based oxide layer having a Zn/Al atomic concentration ratio of less than 1, wherein the Zn-based oxide layer has microirregularities; and the microirregularities have a mean spacing (S) determined based on a roughness curve of 1,000 nm or less and an average roughness (Ra) of 100 nm or less.

Applicants' present claims 13 and 16 relate to a hot-dip galvanized steel sheet, comprising:

a plating layer consisting of a η phase; and
a Zn-based oxide layer containing Fe disposed on the surface of the plating layer.

In applicants' claim 13, it is recited that the Zn-based oxide layer has an Fe atomic concentration ratio of 1 to 50 atomic percent, the Fe atomic concentration ratio being defined by the expression $\text{Fe}/(\text{Fe} + \text{Zn})$, wherein the Zn-based oxide layer has a mean spacing (S) determined based on a roughness curve being 10 to 1,000 nm and an average roughness (Ra) of 4 to 100 nm.

Applicants' claim 16 recites that the Zn-based oxide layer has microirregularities with a network structure including convexities and discontinuous concavities surrounded by the convexities, wherein the Zn-based oxide layer has a mean spacing (S) determined based on a roughness curve being 10 to 1,000 nm and an average roughness (Ra) of 4 to 100 nm.

Claims 1 to 20 were rejected under 35 USC 102 as anticipated or in the alternative, under 35 USC 103 as obvious over Toki (JP 2000-160358) for the reasons set forth in item no. 7 bridging pages 3 and 4 of the Office Action.

It was stated in the Office Action that Toki may not disclose that the plating layer consists essentially of the η phase.

It was also stated in the Office Action that Toki may not describe the oxide layer thickness and composition in the same terminology as that claimed.

It was further stated in the Office Action that Toki may not describe the oxide layer as having microirregularities with a network structure including convexities and discontinuous concavities surrounded by convexities and may not disclose the mean spacing relative to the Ra of the layer.

Claims 1, 2, 4 to 6, 8 to 11, 13 and 15 were rejected under 35 USC 102 as anticipated by or, in the alternative, under 35 USC 103 as obvious over Hashimoto (JP 10-204600) for the reasons set forth in item no. 9 bridging pages 5 and 6 of the Office Action.

It was stated in the Office Action that Hashimoto may not describe the oxide layer composition in the same terminology as that claimed.

JP 2000-160358 discloses in paragraph [0027] that the surface roughness of an oxide layer is set to 1.2 μm or less by

the arithmetic average roughness (Ra) defined by JIS-B0601.

Preferably, it is 0.9 μm or less.

Also, JP 2000-160358 discloses an average roughness of 0.6 to 1.6 μm in Table 2.

JP 10-204600 discloses in [0009] that the concave portion has a larger surface roughness than that of the convex portion. The concave portion has a surface roughness (Ra) of 0.5 to 2.5 μm .

In contrast to JP 2000-160358 and JP 10-204600, the microirregularities according to applicants' present claim 1 have an average roughness (Ra) of 100 nm or less, that is, 0.1 μm or less. The average roughness (ra) according to applicants' present claims is thus smaller than that of JP 2000-160358 and JP 10-204600.

As described on page 12, line 9 to page 13, line 4 of the present specification, sliding performance can be further improved by forming microirregularities in the Zn-based oxide disposed on the surface of the plating layer. The concavities of the microirregularities work as a group of fine oil pits so that a lubricant can be effectively caught therein. That is, in

addition to the sliding friction reducing effect as the oxide, a further sliding friction reducing effect is exhibited because of the fine sump effect in which the lubricant is effectively retained in the sliding section (see page 24, lines 6 to 21 of the present specification).

It is therefore respectfully submitted that applicants' present claims are not anticipated and are not rendered obvious over the references. Withdrawal of the prior art rejections is respectfully requested.

Reconsideration is requested. Allowance is solicited.

An INFORMATION DISCLOSURE STATEMENT is being filed concomitantly herewith.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,



Richard S. Barth

Reg. No. 28,180

Frishauf, Holtz, Goodman & Chick, P.C.
220 Fifth Avenue, 16th Floor
New York, New York 10001-7708
Tel. No. (212) 319-4900
Fax No. (212) 319-5101
E-mail Address: BARTH@FHGC-LAW.COM
RSB/ddf

Encs.: (1) PETITION FOR EXTENSION OF TIME

(2) INFORMATION DISCLOSURE STATEMENT